

CLAIMS

I claim:

1. A propagation system for extending into an enclosure a wireless coverage area provided by a base station located outside of the enclosure, the propagation system comprising:

5 a propagation relay, the propagation relay including at least one antenna for transmitting to and receiving from the base station wireless signals in a first set of frequencies, and for transmitting into and receiving from inside of the enclosure wireless signals in a second set of frequencies, and a frequency converter for converting between the first set of frequencies and the second set of frequencies; and

10 at least one mobile station interface port located in the enclosure, the at least one mobile station interface port including at least one antenna for transmitting and receiving wireless signals in the first set of frequencies and in the second set of frequencies, the at least one mobile station interface port including a frequency converter for converting between the first set of frequencies and the second set of frequencies.

15 2. The propagation system of claim 1, wherein the propagation relay includes a first antenna for transmitting and receiving wireless signals in the first set of frequencies and a second antenna for transmitting and receiving wireless signals in the second set of frequencies.

20 3. The propagation system of claim 1, wherein the at least one mobile station interface port includes a first antenna for transmitting and receiving wireless signals in the first set of frequencies and a second antenna for transmitting and receiving wireless signals in the second set of frequencies.

4. The propagation system of claim 1 further comprising:

a repeater, wherein the repeater is capable of receiving at the second downlink frequency and transmitting at the second downlink frequency.

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5. The propagation system of claim 1 further comprising:

a repeater, wherein the repeater is capable of receiving at the second uplink frequency and transmitting at the second uplink frequency.

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6. The propagation system of claim 1, wherein the at least one mobile station

interface port includes a plurality of mobile station interface ports located in the enclosure, each

one of the plurality of mobile station interface ports including at least one antenna for

transmitting and receiving wireless signals in the first set of frequencies and in the second set of

frequencies and further including a frequency converter for converting between the first set of

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frequencies and the second set of frequencies.

7. The propagation system of claim 6 further comprising:

a repeater, wherein the repeater is capable of receiving at the second downlink frequency and transmitting at the second downlink frequency, and wherein the repeater receives at the

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second downlink frequency from a first mobile station interface port of the plurality of mobile station interface ports and transmits to a second mobile station interface port of the plurality of mobile station interface ports at the second downlink frequency.

8. The propagation system of claim 6 further comprising:

a repeater, wherein the repeater is capable of receiving at the second uplink frequency and transmitting at the second uplink frequency, and wherein the repeater receives at the second uplink frequency from a first mobile station interface port of the plurality of mobile station interface ports and transmits to a second mobile station interface port of the plurality of mobile station interface ports at the second uplink frequency.

9. The propagation system of claim 6, wherein each one of the plurality of mobile station interface ports is located in the enclosure so as to be able to transmit to the propagation relay and to receive from the propagation relay wireless signals in the second set of frequencies.

10. The propagation system of claim 9 further comprising:

at least one mobile station, wherein the at least one mobile station is capable of communicating with at least one of the plurality of mobile station interface ports in the first set of frequencies.

11. A propagation system for providing wireless communications between at least one mobile station located in an enclosure and a base station located outside of the enclosure, the base station transmitting wireless signals at a first downlink frequency and receiving wireless signals at a first uplink frequency, the mobile station transmitting wireless signals at the first uplink frequency and receiving wireless signals at the first downlink frequency, the propagation system comprising:

at least one propagation relay, the at least one propagation relay transmitting within the enclosure at a second downlink frequency wireless signals received from the base station at the first downlink frequency, the at least one propagation relay transmitting to the base station at the first uplink frequency wireless signals received from inside of the enclosure at a second uplink frequency; and

at least one mobile station interface port located in the enclosure, the at least one mobile station interface port transmitting at the second uplink frequency wireless signals received from the at least one mobile station at the first uplink frequency, the at least one mobile station interface port transmitting to the at least one mobile station at the first downlink frequency wireless signals received at the second downlink frequency.

12. The propagation system of claim 11, wherein the at least one propagation relay includes:

a first antenna for transmitting to the base station wireless signals at the first uplink frequency and for receiving from the base station wireless signals at the first downlink frequency; and

a second antenna for transmitting within the enclosure wireless signals at the second downlink frequency and for receiving from the enclosure wireless signals at the second uplink frequency.

13. The propagation system of claim 11, wherein the at least one mobile station interface port includes:

a first antenna for transmitting to the at least one mobile station wireless signals at the first downlink frequency and for receiving from the mobile station wireless signals at the first uplink frequency; and

a second antenna for transmitting wireless signals at the second uplink frequency and for receiving wireless signals at the second downlink frequency.

14. The propagation system of claim 11 wherein the first set of frequencies is within the range of approximately 824 MHz to 1.910 GHz.

15. The propagation system of claim 11 wherein the second set of frequencies is within the range of approximately 40.66 MHz to 2.5 GHz.

16. The propagation system of claim 11, wherein the at least one mobile station interface port includes a plurality of mobile station interface ports located in the enclosure.

17. The propagation system of claim 16, wherein a first mobile station interface port of the plurality of mobile station interface ports is capable of sending to a second mobile station interface port of the plurality of mobile station interface ports at the second downlink frequency and where the second mobile station interface port of the plurality of mobile station interface ports is capable of receiving from the first mobile station interface port of the plurality of mobile station interface ports at the second downlink frequency.

18. The propagation system of claim 16, wherein a first mobile station interface port of the plurality of mobile station interface ports is capable of sending to a second mobile station interface port of the plurality of mobile station interface ports at the second uplink frequency and where the second mobile station interface port of the plurality of mobile station interface ports is capable of receiving from the first mobile station interface port of the plurality of mobile station interface ports at the second uplink frequency.

19. The propagation system of claim 16, wherein each one of the plurality of mobile station interface ports is located in the enclosure so as to be able to transmit to the at least one propagation relay wireless signals at the second uplink frequency and to receive from the at least one propagation relay wireless signals at the second downlink frequency.

20. The propagation system of claim 11, wherein the at least one propagation relay includes a plurality of propagation relays, and where each one of the plurality of propagation relays is capable of receiving from the base station at the first downlink frequency and sending to the base station at the first uplink frequency, and where each one of the plurality of propagation relays is capable of sending to the at least one mobile station interface port at the second downlink frequency and receiving from the at least one mobile station interface port at the second uplink frequency.

21. A method for providing wireless communications between a mobile station located in an enclosure and a base station located outside of the enclosure, the method comprising:

receiving wireless signals at a first downlink frequency transmitted by the base station;
converting the wireless signals at the first downlink frequency into wireless signals at a
second downlink frequency;
transmitting into the enclosure the wireless signals at the second downlink frequency;
5 receiving the wireless signals at the second downlink frequency;
converting the wireless signals at the second downlink frequency into recovered wireless
signals at the first downlink frequency; and
transmitting to the mobile station the recovered wireless signals at the first downlink
frequency.

10 22. The method of claim 21, further comprising:
receiving wireless signals at a first uplink frequency transmitted by the mobile station;
converting the wireless signals at the first uplink frequency into wireless signals at a
second uplink frequency;
15 transmitting the wireless signals at the second uplink frequency;
receiving the wireless signals at the second uplink frequency;
converting the wireless signals at the second uplink frequency into recovered wireless
signals at the first uplink frequency; and
transmitting to the base station the recovered wireless signals at the first uplink
20 frequency.

23. The method of claim 21, wherein the step of receiving wireless signals at a first downlink frequency is done using a first antenna, and wherein the step of transmitting into the enclosure is done using a second antenna.

24. The method of claim 21, wherein the step of receiving wireless signals at a first downlink frequency is done using a first antenna, and wherein the step of transmitting into the enclosure is done using the first antenna.

25. The method of claim 21 wherein the step of receiving the wireless signals at the second downlink frequency is done using a first antenna, and wherein the step of transmitting to the mobile station is done using a second antenna.

26. The method of claim 21 wherein the step of receiving the wireless signals at the second downlink frequency is done using a first antenna, and wherein the step of transmitting to the mobile station is done using the first antenna.

27. The method of claim 22, wherein the step of receiving wireless signals at a first uplink frequency is done using a first antenna, and wherein the step of transmitting the wireless signals at the second uplink frequency is done using a second antenna.

28. The method of claim 22, wherein the step of receiving wireless signals at a first uplink frequency is done using a first antenna, and wherein the step of transmitting the wireless signals at the second uplink frequency is done using the first antenna.

29. The method of claim 22 wherein the step of receiving the wireless signals at the second uplink frequency is done using a first antenna, and wherein the step of transmitting to the base station is done using a second antenna.

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30. The method of claim 22 wherein the step of receiving the wireless signals at the second uplink frequency is done using a first antenna, and wherein the step of transmitting to the base station is done using the first antenna.